IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Antonio Luiz Duarte BRAGANCA et al.

Application No.: 10/518,443	Confirmation No.: 7833
Filed: July 1, 2005	Art Unit: 1793
For: SOLID CATALYST COMPONENT FOR POLYMERIZATION AND COPOLYMERIZATION OF ETHYLENE, AND, PROCESS FOR OBTAINING THE SAME	Examiner: J. E. McDonough

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

December 8, 2008

Madam:

As required under § 41.37(a), this Brief is filed more than two months after the Notice of Appeal filed in this case on September 8, 2008, and is in furtherance of said Notice of Appeal.

The fees required under § 41.20(b)(2), and any required petition for extension of time for filing this brief and fees therefor, are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1205.2:

I.	Real Party In Interest
II	Related Appeals and Interferences
III.	Status of Claims
IV.	Status of Amendments
V.	Summary of Claimed Subject Matter

I.   REAL PARTY IN INTEREST

The real party in interest for this appeal is:

BRASKEM S.A

II.   RELATED APPEALS AND INTERFERENCES

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III.   STATUS OF CLAIMS

A.   Total Number of Claims in Application

There are 62 claims pending in application.

B.   Current Status of Claims

      1.   Claims cancelled: 1, 8, 10, 14, 16, 24, 29, 30, 35, 36, 52

      2.   Claims withdrawn from consideration but not canceled: N/A

      3.   Claims pending: 2-7, 9, 11-13, 15, 17-23, 25-28, 31-34, 37-51 and 53-73

      4.   Claims allowed: None

      5.   Claims rejected: 2-7, 9, 11-13, 15, 17-23, 25-28, 31-34, 37-51 and 53-73

C.   Claims On Appeal

The claims on appeal are claims 2-7, 9, 11-13, 15, 17-23, 25-28, 31-34, 37-51 and 53-73

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IV.   STATUS OF AMENDMENTS

Appellants filed an Amendment After Final Rejection on September 8, 2008. The Examiner respo9nded to the Amendment After Final Rejection with an Advisory Action mailed September 25, 2008. In the Advisory Action, the Examiner indicated that Appellants' proposed amendments to the claims and proposed new claims would not be entered.

Accordingly, the claims enclosed herein as Appendix A do not incorporate either the amendments to claims, or proposed new claims, as indicated in the paper filed. However, the claims in Appendix A do incorporate the amendments indicated in the paper filed by Appellants on September 8, 2008.

V.   SUMMARY OF CLAIMED SUBJECT MATTER

The present invention defines a unique catalyst composition which contains specific amounts of catalytically active components, that is, specific amounts of Ti, Mg and Cl, which when used in a polymerization process produces homopolymers and/or copolymers of either high density polyethylene (HDPE) or Linear Low Density Polyethylene (LLDPE) with a controlled morphology, having one or more of the following properties, that is, high bulk density, a very small quantity of fines in the product, good co-monomer insertion, improved catalytic activity with low catalytic decay, and a substantial homogenous distribution of the alpha-olefin within the polymer chain in connection with LLDPE.

The main focus of the present invention is the specific catalyst, a process for producing such a catalyst, as well as a process for the polymerization or copolymerization of a polyolefin such as polyethylene, using such a solid catalyst. The composition of the catalyst of the present invention which contains Ti, Mg, Cl alkoxy groups and organo metallic compounds and the use of non-polar organic solvents to impregnate the particular silica, defines a catalyst system having a different behavior which, in turn, produces a different final product in the polyolefin polymerization and copolymerization process. That is, because the present invention utilizes a specific amount of titanium, a specific amount of magnesium and a specific amount of chlorine, which remains fixed on the solid catalyst component and because of the use of inert organic

solvents (non-polar solvents), it is possible to produce particles of homo and copolymers of olefins, for example, ethylene, with controlled morphology, having a high bulk density and containing a very small quantity of fines. The catalyst system of the present invention is also effective in achieving good co-monomer insertion into the final product as well as improved catalytic activity and low catalytic decay.

Catalyst systems currently being used in polymerization processes are based on the use of a magnesium dichloride support with titanium sites deposited on the support which is a very high activity catalyst in LLDPE copolymerization. As known in the state of the art, this kind of support produces a catalyst with a high degree multiplicity of titanium sites and because of this fact, the comonomer response LLDPE copolymerization is heterogeneous. This heterogeneous behavior is due to the fact that the titanium sites have a different steric and an electronic neighborhood. This heterogeneity is reflected on the higher xylene soluble fraction which is generated when the LLDPE is produced. With the intention of getting more homogeneity of the titanium sites and, consequently, better comonomer response, Luciani I and Luciani II relied upon by the Examiner and discussed here-in-below added a compound to the process known as a donor or electron donor compound. This donor was added in the catalyst synthesis or during the polymerization and acts as a selective poison for some of the titanium sites. The way it acts is based on Lewis Theory (G.N. Lewis, 1923), which says that in acid-base reactions "bases donate pairs of electrons and acids accept pairs of electrons". In Luciani I and Luciani II, an aromatic or aliphatic ester is used for a solution preparation of magnesium and titanium compounds. In this case both magnesium and titanium compounds used in the solution preparation act as Lewis acids and the ester, which has oxygen groups, acts as a Lewis base. When this solution is deposited over an inert support, part of this donor remains bonded to the titanium or magnesium sites. This kind of selectivity poisoning of titanium or magnesium sites affects the behavior thereof during copolymerization generating more homogeneous sites. This higher homogeneity of the sites, consequently, affects the xylene soluble fraction content which becomes smaller during the copolymerization. Examples of Lewis acids are titanium and magnesium compounds and of Lewis bases are compounds with oxygen, nitrogen groups (water, ester, ether, amines, etc.) which have extra electrons to donate.

As can be seen by referring to the present application, no electron donor or donor is used, as detailed in the Summary of the Invention, in the Detailed Description and in the Claims. In the present invention, the homogeneity of the sites of the solid catalyst component is reached through the amounts of components present in the solid catalyst and in the fact that no donor or electron donor is used during the solid catalyst component preparation.

VI.   GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 2-7, 9, 11-15, 17-23, 25-28, 31-34, 37-51 and 53-73 have been rejected by the Examiner under 35 USC 103(a) as being unpatentable over Luciani et al., EP 0480483 (Luciani I). Claims 2-7, 9, 11-15, 17-23, 25-28, 31-34, 37-51 and 53-73 have been rejected by the Examiner under 35 USC 103(a) as being unpatentable over Luciani et al. EP 0522651 Luciani II).

Claims 2-7, 9, 11-15, 17-23, 25-28, 31-34, 37-51 and 53-73 have been rejected by the Examiner under 35 USC 103(a) as being unpatentable over WO 91108239 (Neste).

VII.   ARGUMENT

As discussed hereinabove, one of the important features of the present invention is a specific catalyst, and its use in the polymerization or copolymerization of a polyolefin such as polyethylene. Thus, because the present invention utilizes a specific amount of titanium, a specific amount of magnesium and a specific amount of chlorine, homo and copolymers of olefins can be produced with a controlled morphology, having a high bulk density and containing a very small quantity of fines. The catalyst system of the present invention is also effective in achieving good co-monomer insertion into the final product as well as improved catalytic activity and low catalytic decay.

In rejecting the claims of the present application the Examiner has relied upon Luciani et al., EP 0480435 (hereinafter referred to as Luciani I), Luciani et al., EP 0522651 (hereinafter referred to as Luciani II) and WO 91108239 (hereinafter referred to as Neste). Table I below

compares the amounts of Ti, Mg and Cl present in the catalyst system of the present invention with that of Luciani I, Luciani II and Neste.

TABLE 1 – Elemental ranges

	Present Application	EP 0480435 B1 Luciani I	EP0522651 B1 Luciani II	WO91/08239 Neste
Ti range (% w/w)	0.5 - 2.0	3.9 – 4.5 (outside)	3.7 – 4.4 (outside)	3.2 – 4.9 (outside)
Mg range (% w/w)	0.3 - 3.0 0.3 – 1.5 (pref)	2.7 – 5.0 (barely inside) (outside)	3.4 – 3.9 (outside)	0.70 – 1.75 (inside)
Cl range (% w/w)	5.0 - 12.0	17.7 – 21.0 (outside)	12.4 – 19.7 (outside)	12.2 – 22.5 (outside)
TOTAL (% w/w)	5.8 – 17.0	24.3 – 30.5 (outside)	19.5 – 28.0 (outside)	16.1 – 29.15 (barely inside)

As can be readily observed from Table I, Luciani I is outside the Appellants' range in three out of four categories; Luciani II is outside the Appellants' range in all four categories, and Neste is outside the Appellants' range in two our of four categories.

As the Examiner acknowledges, the prior art does not disclose the amount of titanium, magnesium and chlorine which is present in the catalyst composition of the present invention (please see Table 1). The Examiner attempts to overcome this deficiency by arguing that it would be obvious to adjust the amounts of titanium, magnesium and chlorine of the prior art to fall within the Appellants' range to achieve the Appellants' results. However, the adjustments referred to by the Examiner requires a consideration of three different parameters, that is, the amount of titanium, the amount of magnesium and the amount of chlorine as well as the total amount of titanium, magnesium, and chlorine which is present in the catalyst composition of the present invention. As previously stated in connection with the Luciani I reference, three of the four parameters, that is, the amount of titanium, the amount of chlorine and the total amount of titanium, magnesium and chlorine are substantially outside of the Appellants' range. In connection with Luciani II, all four parameters, that is, the amount of titanium, the amount of

magnesium, the amount of chlorine and the total amount of titanium, magnesium and chlorine fall outside the Appellants' range. In the case of the Neste reference, two of the four components, that is, the amount of titanium and the amount of chlorine fall outside the Appellants' range. Thus, in an attempt to meet the limitations recited in the claims of the present application, the inventions of the respective references must be changed and the amounts of the respective components must be either increased or decreased depending on the specific situation. Since there is no reason given why one skilled in the art would change the amounts of the various components in the references, that is, either increasing the amounts of components or reducing the amounts of components, the only way that the Examiner can arrive at the Appellants' specific catalyst with the specific amounts of titanium, magnesium, chlorine, and the like, is to make adjustments to the prior art compositions in view of the Appellants' own disclosure. Working with a plurality of component ranges certainly argues against the obviousness of making such changes to arrive at the Appellants' inventive contribution.

The present invention is directed to a process for producing a solid catalyst component used in the polymerization of olefins, for example, ethylene, as well as a solid catalyst component per se in a process for the polymerization of a polyolefin such as polyethylene, using such a solid catalyst. In the present invention, because a specific amount of titanium, a specific amount of magnesium, and a specific amount of chlorine, as well as a specific amount of all three components, are utilized and remain fixed on the solid catalyst component and because of the use of inert organic solvents "non-polar solvents," it is possible to produce particles of homo and copolymers of olefins, for example, ethylene, with a controlled morphology having a high bulk density and containing a very small quantity of fines. The catalyst system of the present invention is also effective in achieving good co-monomer insertions in the final product as well as an improved catalyst activity with low catalytic decay. All of these features of the present invention have been clearly shown in the Declarations submitted to the USPTO with the response dated January 8, 2008. Table 2 below has been reproduced from the Declaration for the purposes of discussion.

The important aspect regarding the elemental ranges (Table 1) is that in Luciani I, Luciani II and Neste, the Ti amount is very high and to activate these sites it is usual to use a high amount of the cocatalyst which is usually an aluminum alkyl. This aluminum alkyl acts, in this case, as a Lewis acid and can remove from Ti and also from Mg sites, any donor or electron donor compound, beyond its function as reducing and alkylating agent. In both Luciani I and Luciani II patents they use a donor or electron donor as a solvent for the titanium and magnesium solution. The remaining donor at the final catalyst can be removed by this aluminum alkyl, during the polymerization. One of the reasons to use a donor, as mentioned before, is to obtain homogeneity on titanium sites and, consequently, obtain fewer sites which produce the xylene soluble fraction in LLDPE. Consequently, when the catalyst has a high amount of titanium sites, the comonomer response is not as good as that of the present invention which uses a catalyst with a very small amount of titanium. Table 2 taken from the Declaration filed January 8, 2008, below demonstrates a comparison between examples from Luciani I, Luciani II and Neste and an example of the catalyst of the present invention, used in copolymerization of ethylene and butene-1 to produce a LLDPE product. The examples from Luciani I, Luciani II and Neste were reproduced in the lab and used in copolymerization, as shown in Table 2.

Table 2

Comparative Test Number	Luciani II TEST 1	Luciani II TEST 2	Ludiani I TEST 3	Luciani II TEST 4	Neste TEST 5	Neste TEST 6	Neste TEST 7	TEST 8
Product	LLDPE	LLDPE	LLDPE	LLDPE	LLDPE	LLDPE	LLDPE	LLDPE
Catalyst from	EP 0522651 B1 patent (Example 1)	EP 0522651 B1 patent (Example 4)	EP 0480435 B1 patent (Example 3)	EP 0522651 B1 patent (Example 1)	WO 91/08239 patent (Example 10)	WO 91/08239 patent (Example 10)	WO 91/08239 patent (Example 10)	Patent Application - 0315-0158PUS1 (Example 8)
Ti (%w/w)	6.8	5.2	5.6	6.8	3,9	3,9	3,9	2.0
Mg (%w/w)	2.7	3.4	2.3	2.7	1.9	1.9	1.9	1.5
Aluminum alkyl	TEAL	TEAL	TEAL	TEAL	TEAL	TEAL	TEAL	TEAL
Ethylene parcial pressure (bar)	5	5	5	5	5	5	5	5
Temperature (°C)	75	75	75	75	75	75	75	75
Time (h)	3	3	3	3	3	3	3	3
Al/Ti	300	300	300	300	300	300	300	300
Butene-1 (L)	0.29	0.29	0.29	0.7	0.29	0.7	1.1	0.29
$H_2/C_2^=$ molar ratio	0.47	0.47	0.40	0.40	0.47	0.40	0.35	0.40
Bulk Density (g/cm³)	0.26	0.30	0.27	0.29	0,30	0.31	N.A.	0.36
Fines (%)	N.A.	3.0	2.8	2.2	1.5	1.7	N.A.	0.1
MFI (2.16) (g/10')	1.00	1.30	0.40	1.34	0.29	1.25	1.30	0.91
Butene content (% w/w)	5.7	6.7	4.7	9.7	5.5	N.A.	N.A.	8.7
Density (g/cm³)	0.938	0.925	0.928	0.918	0.925	0.923	N.A.	0.917
Xylene soluble (% w/w)	5.3	7.3	6.9	14.2	3.0	5.2	N.A.	9.7

N.A. = not analyzed

The copolymerization condition to specify a LLDPE product, with MIE close to 0.8 - 1.3 g/10 min range and a density close to 0.9170-0.9190 g/cm3, for catalyst Example 8 of the present invention is demonstrated in Test 8 of Table 2 (see the description of polymerization conditions on Example 12 of the present application). It can be seen in Table 2, that this copolymerization condition was the same for all Tests with the exception of Tests 4 and 6, where a higher amount of butene-1 was used (0.70 L). It can be seen from Table 2 that, using the same conditions of

Test 8, from the present application, neither catalysts from Test 1, 2, 3 nor 5 showed a LLDPE product with a Density close to that obtained in Test 8. To obtain the same range of MIE of LLDPE obtained in Test 8, it was necessary to have a higher H2/C2= molar ratio for Tests 1, 2 and 5. To obtain a LLDPE product with a density closer to that shown in the Test 8, it was necessary to use higher amounts of butene-1 during the copolymerization, as can be seen in Test 4. For the catalyst example from Neste, it was not possible to obtain a density between 0.9170-0.9190 g/cm3, with the amount of 0.70 L of butene-1, as can be seen in Test 6.

In all of these products the xylene soluble fraction was analyzed. When the same kind of product is compared for Tests 4 and 8 (LLDPE with the same MIE and Density ranges), it can be seen that the xylene soluble fraction is quite different (14.2 and 9.7 % w/w, respectively). These different xylene soluble fraction results are due to the following facts:

1- High amount of Titanium: to activate these sites it is usual to use a high amount of the cocatalyst which is usually an aluminum alkyl. This aluminum alkyl acts, in this case, as a Lewis acid and can remove from Ti (and also from Mg sites), any donor or electron donor compound - in Luciani I and Luciani II a donor or electron donor is used as a solvent for the titanium and magnesium solution.

2- Low amount of Ti and Mg in the present invention - the smaller xylene soluble fraction is due to the lower amount of titanium and magnesium relative to the silica support and the ratio between titanium and magnesium compounds used.

Table 2 clearly shows that by utilizing the catalyst system of the present invention a LLDPE product of high bulk density (0.36 – a minimum 16+% improvement over the closest prior art) at a sufficiently low polymer density (0.917) and with a reduced amount of fines can be effectively achieved.

As can be appreciated, catalyst systems are sensitive to many influences and as such are unpredictable in their behavior. This is clearly shown in the Experimental Data presented in Table 2, when arguably small changes in the catalyst composition produces results such as a high

bulk density, a small amount of fines and low amount of xylene solubles, all of which drastically influence economic considerations.

Additional examples showing many of the advantageous features of the present invention can be found in Examples 13 to 23 of the present application as summarized in Table 1 on page 31. The polymers produced in Examples 13 to 23 utilized the catalysts produced in Examples 1 to 10. In all examples a good catalystic yield and no agglomerates on sheets were formed. The polymer obtained possessed good morphology and in most cases, less than 1% of fines (<250 μm). Also, the films obtained with these polymers presented good optical properties and low blocking strength.

In order to further demonstrate the technical effects of the present invention over Luciani I, the Appellants, in the Declaration filed January 8, 2008, the results of which are reproduced herein, conducted tests to compare the properties of polymers obtained by polymerization or copolymerization processes using catalysts prepared according to Luciani I and the present invention.

The tests described here-in-below were carried out using exactly the same polymerization conditions employed in the examples of Luciani I, but using different catalystic systems, i.e., catalyst according to Example 1 of Luciani I or catalyst according to Examples 11 or 12 of the present application.

Table 3

Comparative Test Number	1	2
Product	HDPE	HDPE
Catalyst used	Ex.1 of Luciani I	Ex. 11 of the present application
Alkyl-aluminum	TEAL	TEAL
Catalyst mass (mg)	60	60
Temperature (°C)	90	90
Time (h)	2	2
Al/Ti	70	70
H2/C2	0.47	0.47
Activity (KgPol/gTi)	4.2	3.0
Bulk Density (g/cm^3)	0.32	0.40
MIF (2,16) (g/10min)	2.84	0.9
Density (g/cm^3)	0.9563	0.9632

Comparative Test Number	3	4
Product	LLDPE	LLDPE
Catalyst used	Ex.1 of Luciani I	Ex. 12 of present application
Alkyl-aluminum	TEAL	TEAL
Catalyst mass (mg)	60	60
Temperature (°C)	75	75
Time (h)	3	3
Al/Ti	300	300
$C_4^=$ (ml)	290	290
$H_2/C_2^=$	0.40	0.40
Activity (KgPol/gTi)	3.0	6.6
Bulk Density (g/cm^3)	0.26	0.36
Mesh 250 + bottom (%)	2.8	0.1
MIF (2,16) (g/10min)	0.40	0.91
Content of binded butene (%)	4.7	8.7
Density (g/cm^3)	0.9283	0.9170

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The above results, relative to the tests 2 and 4, show a higher bulk density, a lower amount of fines and a better comonomer insertion (test 4 only) for the polymer obtained according to the present invention.

The tests shown here-in-below (Table 4) were carried out using exactly the same polymerization condition employed in the examples of Luciani II, but using different catalystic systems: catalyst according to Ex. 1 of Luciani II (test 5), catalyst according to Ex. 4 of Luciani II (test 6) and catalyst according to Ex. 11 of the present patent application (test 7).

The results obtained in tests 5 and 6 are quite similar to the corresponding ones presented in Luciani II, which show the correctness of Applicants' proceedings.

The higher bulk density and the low quality of fines obtained in test 7 show the superiority of the polymer prepared according to the present invention. The value obtained for the bulk density (0.40 g/cm^3) is within the range of 0.33-0.438 g/ml considered by US 5,585,317 as distinctive of HDPE having good morphology.

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Table 4

Comparative Test Number	5	6	7
Product	HDPE	HDPE	HDPE
Catalyst used	Ex.1 of Luciani II	Ex.4 of Luciani II	Ex.11 of the present application.
Alkyl-aluminum	TEAL	TEAL	TEAL
Catalyst mass (mg)	60	60	60
Temperature (°C)	90	90	90
Time (h)	1.5	1.5	1.5
Al/Ti	50	50	50
H_2/C_2	0.47	0.47	0.47

	5	6	7
Activity (KgPol/gTi)	37.0	109.0	100.0
Bulk Density (g/cm^3)	0.30	0.32	0.40
Mesh 250 + bottom (%)	-	7.12	0.17
MIF (2.16) (g/10min)	2.51	2.46	0.9
Density (g/cm^3)	0.9592	0.9572	0.9632

Similarly, tests were carried out for LLDPE using different catalysts of Lucian II (tests 8 and 9) and of the catalyst of the present invention (test 10) and following the polymerization conditions employed in Example 12 of the present application, since Luciani II itself does not present any test for LLDPE

Table 5

Comparative Test Number	8	9	10	11
Product	LLDPE	LLDPE	LLDPE	LLDPE
Catalyst used	Ex.1 of Luciani II	Ex.4 of Luciani II	Ex.12 of the present application.	Ex.1 of Luciani II
Alkyl-aluminum	TEAL	TEAL	TEAL	TEAL
Catalyst mass (mg)	60	60	60	60
Temperature (°C)	75	75	75	75
Time (h)	3	3	3	3
Al/Ti	300	300	300	300
$C_4^=$ (ml)	290	290	290	700
$H_2/C_2^=$	0.47	0.47	0.47	0.40
Activity (KgPol/gTi)	74	300	330	76
Bulk Density (g/cm^3)	0.26	0.30	0.36	0.28
Mesh 250 + bottom (%)	-	3.0	0.1	0.1
MIF (2.16) (g/10min)	1.00	1.30	0.91	1.34
Content of binded butene (%)	5.7	6.7	8.7	9.7
Density (g/cm^3)	0.9382	0.9251	0.9170	0.9187
Xylene solubles (%)	5.3	7.3	9.7	14.2

The polymer prepared according to the present invention produces better comonomer insertion (50% more butane incorporated in test 10 comparing to the value of test 9), higher bulk density and lower amount of fines. Once again, the bulk density obtained (0.36 g/cm^3) is within the range provided by US 5,585,317 upon describing LLDPE with good morphology.

In the test number 11, Applicants use a catalyst in accordance with Luciani II and change the process conditions, particularly the amount of butene in the reaction medium, in order to obtain a final product having a density very similar to that of the product of test 10, in which a catalyst according to the present invention is employed.

The butene is so badly distributed in the molecule of test 11 that the content thereof should be much higher so that the desired low density is obtained. The bad comonomer insertion also produces a lower amount of solubles, when compared to the result of test 10, in connection therewith, please note that the soluble amounts of the products obtained in tests 8 and 9 are lower than that of test 10 simply because their densities are higher than the density of the product obtained according to the present invention (test member 10).

The low amount of fines obtained in test 11 (0.1%) is due to the great quantity of solubles which leads to a sticky product in which the small particles remain joined together.

One of the unexpected results obtained from the present application, when compared to the cited prior art references (**EP 0522651A, EP 0480435A** and **WO 91/08239**), is the crystalline structure deposited over the support of the catalytic composition, which directly affects the behavior of the active sites during the olefin polymerization.

In an attempt to demonstrate to the Examiner the non obviousness of the present invention, one of the "tools" used was the reproduction of some examples shown in the cited references which enables a better understanding of each invention. In this way, it is possible to demonstrate the inventiveness of the present invention, when applied in polymerization processes, because the polymers produced according to the examples show inferior properties when compared to the properties of polymers obtained in accordance with the present invention.

Some of the major benefits obtained by the present invention are as follows:

1-   The ability to produce a copolymer with a low amount of xylene soluble (XS) (<10%) using the catalytic composition of the present invention. Please see claim 62 of the present application.

2-   The ability to achieve the catalytic composition of the present invention with a simplified preparation process.

3-   The ability to achieve a catalytic composition with low levels of Ti and Mg. Please see claims 58 and 65 of the present application.

4-   Obtaining polymers with a high bulk density. Please see claims 62 and 70 of the present application.

In order to understand why a copolymer according to the present application shows low amount of XS when compared to the polymers produced in accordance with examples from the three prior art references, it is important to carefully consider the following:

Upon examining references **EP 0522651A** and **EP 0480435A**, step (ii) from the process to prepare the solid component catalyst from the first reference (EP 0522651A) shows the impregnation of the support with a solution made from a mixture of magnesium chloride ($MgCl_2$), titanium compounds ($TiCl_4$ and $Ti(OR)_4$) and a liquid aliphatic or aromatic ester, which has the ability to solubilize both magnesium and titanium compounds. In the same way, in step (1) of the process of catalyst preparation of the second reference (EP 0480435A), a solution of $MgCl_2$, a titanium compound ($Ti(OR)_4$) and an aliphatic ester, which has the ability to solubilize both magnesium and titanium compounds, is produced. Thus, in both references, the ester, which has COO as a functional group, acts as an electron donor compound.

It is well known in organometallic chemistry that, when an electron donor compound is used, such as for example, n-butanol or methyl acetate, the $MgCl_2$ crystal is destroyed, as observed by Kashiwa and co-workers [ref 1]. This happens because the $MgCl_2$ crystal shows (100) and (110) lateral cuts in the structure wherein there are coordinatively unsaturated Mg^{2+} ions with coordination numbers 4 and 5, respectively. [refs 2,3] (see Figure 1). The presence of the electron donor will make it more strongly bonded to the (110) lateral cut, since this is the most acid one (Lewis acid) and this association will form organometallic compounds known as adduct [refs 4,5-11]. Metal salts such as $TiCl_4$, belonging to block d of the Periodic Table, which have the tetrahedral structure, may also form adducts in the presence of electron donor compounds or solvents [ref 11].
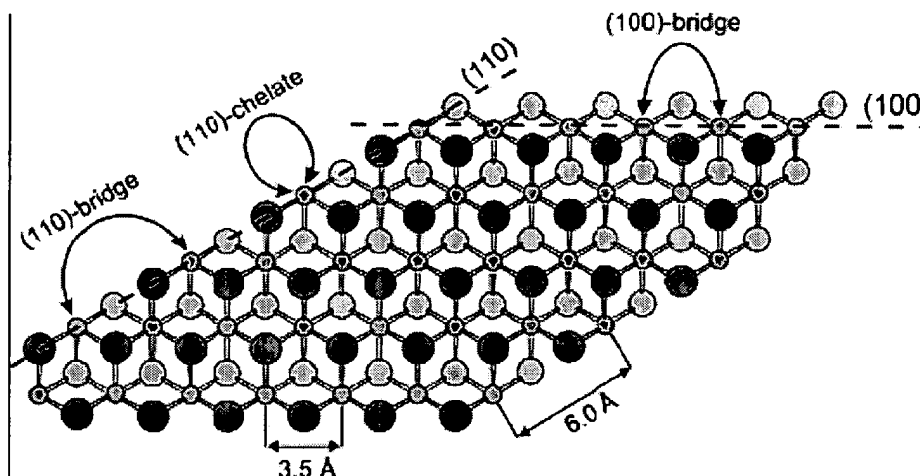
Figure 1. Schematic representation of a $MgCl_2$ monolayer. The Mg atoms are colored in orange. The Cl atoms above the Mg plane are dark green colored, whereas the Cl atoms below the Mg plane are light green colored. The (100) and (110) lateral cuts with 5- and 4-coordinated Mg atoms are indicated. The double arrow curves represent possible coordination modes of the donors.

The inventions disclosed in the above references (**EP 0522651A** and **EP 0480435A**) both comprise a support which is thermal activated silica. In all references, including this application, the silanol and siloxane groups which are on the surface of the silica, are reacted with organometallic compounds containing metals from groups 1, 2, 12 or 13 of the Periodic Table. In this way, the titanium active centers impregnated over the silica will not be directly linked to these oxygenated groups from silica. In other words, these oxygenated groups will not donate electrons to the titanium, as they are not linked to each other.

After the impregnation of the silica with the solution produced in these references (**EP 0522651A** and **EP 0480435A**), the polar solvent starts to be removed by reduced pressure and the catalytic product, composed of electron donor adducts with $MgCl_2$, $TiCl_4$ and/or $Ti(OR)_4$, starts to precipitate. It is important to observe that the product which precipitates over the silica, initially consisting of $MgCl_2$, $TiCl_4$ and/or $Ti(OR)_4$ adducts with the polar solvent, the latter being the electron donor, has a modified crystalline structure compared to the original salts, even if the aluminum alkyl removes all electron donor after the precipitation or deposition step.

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The final crystalline structure is different in terms of steric and electronic neighborhood of the titanium atom. In the present application, no polar solvent acting as electron donor is used during the catalyst preparation. This means that there is no need to have a removal step of the solvent, by reduced pressure or any other way, making the process of the present invention simpler and less costly. In addition, in the present application, the precipitation of the catalytic product over the silica occurs in step (f) which corresponds to the reaction with the chlorinated agents and in this way there is no adduct formation.

When comparing the catalytic product precipitated over the silica in the references with the catalytic products of the present invention, the crystalline structures are different because during the removal step of the polar solvent (electron donor), the solvent influences the formation and modifies the crystalline structure deposited over the silica.

With respect to the reference **WO 91/08239**, the precipitation of the catalytic portion over the silica occurs by its reaction with chlorinated alkyl aluminum, such as ethyl-aluminum-dichloride, diethyl-aluminum-chloride or ethyl-aluminum-sesquichloride, which has reduction agent characteristics. In such a way, in this step, pre-reduction of Ti^{IV} to Ti^{III} species also occurs, and this reduced species can be presented in four different crystalline forms (α, β, γ and δ) wherein the β is the preferred one when a reaction with the alkyl takes place [ref. 12]. In the case of the present invention, the chlorination stage preferably occurs through agents, such as $SiCl_4$, which is an oxidant compound. Thus, there is no formation of Ti^{III} species in this stage, since it preferably uses an oxidizing agent such as a chlorinating compound. In the process of the present invention it is optional to have a reaction with aluminum alkyl after the chlorination stage. Thus the catalytic composition from reference WO 91/08239 has titanium sites with different oxidation states and also a different electronic and steric neighborhood, when compared to the present invention.

Thus, it is not obvious that, when the polar solvent (electron donor) is removed, the catalyst compound which is produced is equivalent to the catalyst compound of the present

invention. Thus, once a polar solvent is used in the preparation of the catalyst, it influences the crystalline structure of the active sites in the final catalyst.

Thus, the crystalline structure that is deposited on the silica of the prior art references (**EP 0522651 A, EP 0480435 A** and **WO 91/08239**) will not have the same behavior in ethylene copolymerization with α-olefins when compared to the structure of the present invention, because when these monomers coordinate on the active site, they will be electronically and sterically influenced in a different way when compared to coordination with the sites of the present invention.

In order to demonstrate the effect of this difference in the steric and electronic neighborhood, new copolymerization tests, using examples of these references and of the present application, have been carried out in order to obtain LLDPE films having as their main characteristic a MFI of between 0.65 to 0.91g/10 min and a density between 0.917 to 0.919 g/cm^3.

The reaction conditions used, such as the solvent, temperature, cocatalyst, Al / Ti molar ratio and the reaction time, were the same for all examples (Table 6 identical to Table 1 submitted in the Request for Reconsideration dated September 8, 2008). The main properties evaluated on the obtained polymers were the amount of xylene soluble (XS) and the viscosity of this soluble fraction. The XS extracted from the polymers represents an amorphous or oligomer product containing a high concentration of comonomer and the amount produced depends on the active site behavior (steric and electronic neighborhood). In its turn, the viscosity of this soluble fraction represents its molecular weight.

Upon comparing, on the same basis, the LLDPE having MFI ranging from 0.65 to 0.91g/10 min and density ranging from 0.917 to 0.919 g/cm^3 (see Test numbers 1, 2, 4 and 5), it can be observed that the amount of XS were higher in the polymers from tests 2, 4 and 5, which represents examples from the 3 references (**EP 0522651 A, EP 0480435 A** and **WO 91/08239**).

The maximum allowable quantity of XS in industrial LLDPE production, in slurry or gas phase reactions, is 10% wt because more than this amount could make the process impracticable in terms of "chunks" formation risk, which could stop the production and thus increase cost.

Moreover, the presence of the higher amount of XS in the polymer could cause the phenomenon known as "blocking," which means the migration of this fraction to the surface of films obtained from this type of resin causing the "stickiness" of the films. The blocking problem can be solved by the addiction to the resin of large volumes of silicates, thus creating a rough surface. However, in this case, transparency properties of the product are affected. The present invention appropriately fulfills these requirements, providing a resin which produces a high transparent film without blocking characteristics. One of the main applications of these kinds of films is the automatic packaging of grains, which represents a big volume in the Brazilian market.

Table 6

	Comparative Test Number	1	2	3	4	5	6
	Product	LLDPE	LLDPE	LLDPE	LLDPE	LLDPE	LLDPE
Catalysts Data	Catalyst used	Ex.12 of the present application	Ex.1 of EP 0522651 A	Ex.4 of EP 0522651 A	Ex.10 of WO 91 08239 A	Ex.3 of EP 0480435 A	Ex.10 of WO 91 08239 A
	Ti (% wt)	2.0	3.0	5.2	3.9	5.6	3.9
	Mg (% wt)	1.5	2.8	3.4	0.8	2.3	0.8
	Electron donor in the catalyst preparation?	No	Yes	Yes	No	Yes	No
Polymerization Data	Cocatalyst	TEAL	TEAL	TEAL	TEAL	TEAL	TEAL
	Catalyst mass (mg)	60	60	60	60	60	60
	Temperature (°C)	75	75	75	75	75	75
	Time (h)	3	3	3	3	3	3
	Al/Ti	300	300	300	300	300	300
	Amount of butene-1 added (ml)	290	1000	700	900	800	900
	H_2/C_2^- (bar/bar)	0.47	0.50	0.40	0.40	0.40	0.45
Polymerization Results	Activity (KgPol/gTi)	330	114	76	127	80	76
	Bulk Density (g/cm³)	0.36	0.30	0.29	0.30	0.27	0.31
	MFI (2.16) (g/10min)	0.91	0.98	1.34	0.84	0.76	1.53
	Density (g/cm³)	0.9170	0.9184	0.9187	0.9190	0.9189	0.9176
Polymer Properties	Content of butene in the polymer (%wt)	8.7	8.9	9.7	8.4	9.0	10.0
	Xylene solubles (%wt)	9.7	14.5	14.6	14.1	15.7	16.2
	Intrinsic viscosity of Xylene Soluble fraction (dl/g)	1.46	0.98	N.A.	1.00	N.A.	1.10
	Intrinsic viscosity of Amorphous fraction (dl/g)	1.44	1.29	N.A.	0.98	N.A.	1.13
N.A. = NOT ANALYSED							

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During the ethylene copolymerization with butene-1, it is known that the comonomer incorporation in LLDPE results in polymer chain irregularities which modify the ability of crystallization. The composition distribution can be measured by a technique called CRYSTAF which separates molecules according to their amount of comonomer (see ref 13). This technique is based on monitoring the crystallization of LLDPE and the concentration is measured during crystallization. This technique was also used in order to demonstrate that the catalytic systems present in the references have a different behavior when compared with the present invention (see graphic 1).
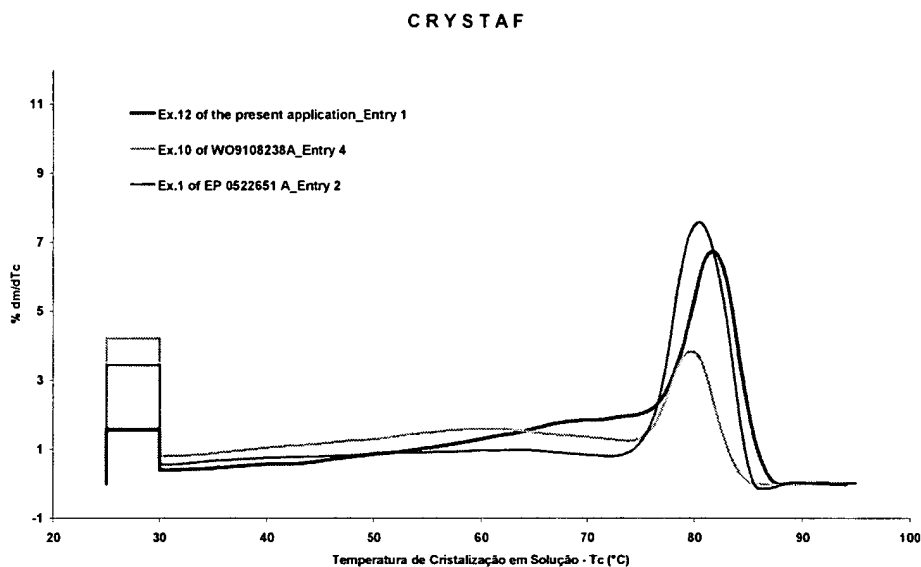
CRYSTAF

Graphic 1

Upon analyzing the above Graphic, it is observed that when the temperature begins to decrease, the polymer fractions, which crystallized faster and are composed of molecules with little or no comonomer, precipitate first, thus resulting in a decrease in the concentration of the solution. As the temperature decreases, fractions of polymers with the largest amount of comonomer precipitate. The last fractions represent those polymers which remained soluble due to the low molecular weight and the high amount of comonomer, i.e., a fraction soluble in Xylene (XS).

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Thus, the main contributions of the present invention, in relation to the prior art, are:

1- Achieve a catalytic composition with low levels of titanium and without the use of a polar solvent acting as an electron donor, making the process easier and less costly, since there is no need to add, or remove this product;

2- Achieve a catalytic composition with a crystalline structure different from the prior art, even if the polar solvent is removed in the process of the prior art references;

3- Achieve a LLDPE product with XS lower than 10% wt, which is needed to achieve better process performance without risk of "chunks" formation;

4- Achieve a LLDPE product with XS lower than 10% wt, which is a requirement for obtaining films without blocking and, as a consequence, superior transparency properties;

5- Achieve a good product performance with XS lower than 10% wt for films which have as an application the automatic packaging of grains, which represents a big volume in the Brazilian market.

Upon comparing the Ti/Mg molar ratio used in the preparation of catalysts with those which are supported in the final solid catalyst, Table 7 which is identical to Table 2 submitted in the Request for Consideration dated September 8, 2008, shows these parameters, comparing all examples form the 3 references (**EP 0522651 A, EP 0480435 A** and **WO 91/08239**) and those from the present application.

Upon analyzing the results of Table 7, it is demonstrated that the Ti/Mg molar ratio used during the preparation of the catalysts does not necessarily produce a solid catalyst with the same Ti/Mg molar ratio. It should be noted that in all cases described in the references and in the present application, there are washing steps, siphoning, and filtrations and as well as chemical processes that must occur during the synthesis.

The subject matter of Tables 6 and 7 above (Tables 1 and 2 of the Request for Reconsideration filed September 8, 2008), can be presented in the form of a Declaration Under 37 CFR 1.132 if necessary.

Table 7

		PREPARATION OF SOLID COMPONENT CATALYST			FINAL SOLID COMPONENT CATALYST		
		Amount of added Ti to the solution (mol)	Amount of added Mg to the solution (mol)	Ti/Mg molar ratio at the solution (mol/mol)	Amount of Ti at final solid component catalyst (mol)	Amount of Mg at final solid component catalyst (mol)	Ti/Mg molar ratio at final solid component catalyst (mol/mol)
Present Application	Example 1	0.969	0.462	2.1	0.146	0.082	1.8
	Example 2	0.116	0.055	2.1	0.029	0.021	1.4
	Example 3	0.116	0.055	2.1	0.025	0.012	2.1
	Example 4	0.116	0.055	2.1	0.031	0.012	2.6
	Example 5	1.163	0.554	2.1	0.036	0.099	0.4
	Example 6	1.163	0.554	2.1	0.038	0.112	0.3
	Example 7	0.528	0.252	2.1	0.044	0.058	0.8
	Example 8	0.528	0.252	2.1	0.043	0.062	0.7
	Example 9	1.163	0.554	2.1	0.040	0.119	0.3
	Example 10	0.528	0.252	2.1	0.042	0.053	0.8
EP 0522651 A	Example 1	0.0291	0.0294	1.0	0.0897	0.156	0.6
	Example 2	0.0291	0.0294	1.0	0.090	0.161	0.6
	Example 3	0.0291	0.0294	1.0	0.090	0.140	0.6
	Example 4 (COMPARATIVO)	0.0291	0.0294	1.0	0.077	0.156	0.5
	Example 5 (COMPARATIVO)	0.0291	0.0294	1.0	0.092	0.152	0.6
	Example 6 (COMPARATIVO)	0.0290	0.0294	1.0	0.088	0.144	0.6
	Example 7 (COMPARATIVO)	0.0290	0.0294	1.0	0.092	0.156	0.6
	Example 8 (COMPARATIVO)	0.0290	0.0294	1.0	0.086	0.148	0.6
EP 0480435 A	Example 1	0.0194	0.0196	1.0			0.5
	Example 2	0.0194	0.0196	1.0			0.7
	Example 3	0.0194	0.0196	1.0			0.7
WO 91 08239 A	Example 1	0.0082	0.0041	2.0	0.102	0.031	3.3
	Example 2	0.0082	0.0041	2.0	0.092	0.029	3.2
	Example 3	0.0082	0.0041	2.0	0.081	0.029	2.8
	Example 4	0.0082	0.0041	2.0	0.086	0.040	2.2
	Example 5	0.0165	0.0081	2.0	0.100	0.045	2.2
	Example 6	0.0123	0.0061	2.0	0.094	0.041	2.3
	Example 7	0.0082	0.0041	2.0	0.080	0.029	2.8
	Example 8	0.0082	0.0041	2.0	0.096	0.041	2.3
	Example 9	0.0082	0.0041	2.0	0.100	0.031	3.2
	Example 10	0.0082	0.0041	2.0	0.073	0.031	2.4
	Example 11	0.0082	0.0041	2.0	0.067	0.029	2.3
	Example 12	0.0082	0.0041	2.0	0.119	0.070	1.7
	Example 13	0.0021	0.0021	1.0	0.083	0.072	1.2
	Example 14 (Use of vanadium)						

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Throughout the Examiner's Office Action, the Examiner argues that the Appellants have not shown that the composition of the reference can not produce polymers having properties as defined by the present invention. However, in the Declaration which is of record in the present application, the Appellants have compared the Examples of the present invention with those of the prior art and, in fact, have shown that the prior art does not achieve the Appellants' advantageous properties, such as for example bulk density, the presence of fines, a copolymer with a low amount of xylene solubles (XS) and the like. In this connection, the Examiner argues that comparing prior art examples with the Examples of the present invention is not persuasive since the reference is considered to be good for all that it teaches. However, it is the Appellants' position that comparing respective examples is the best type of comparison since working examples are certainly much more likely to reflect the inventive contribution of the respective references. Also, the Examiner argues that the results in the Declarations do not show that the present invention is "always superior" to the prior art. Of course, this position is clearly erroneous since it is traditionally understood that when comparing a multiplicity of examples for the purpose of showing unexpected results, it is certainly acceptable that from time to time, one

or more examples may not quite perform in the same manner as most of the examples relied upon in the Declaration.

Because the catalyst composition of the present invention is a component part of the process for producing the catalyst composition as well as the process for copolymerizing ethylene to produce a product having the properties of, for example, claims 62 to 64, including the polyethylene films of claims 72 and 73, it is believed that all of the arguments for patentability presented herein equally apply to all of the claims of the present application.

Conclusion

In the Examiner's Advisory Action dated September 25, 2008, the Examiner makes a number of technical arguments which have been answered by the Inventor, Dr. Miranda, both at the personal interview and in the Appellants' many responses submitted to the USPTO. The differences in opinions appear to be based on the Examiner's academic approach and Dr. Miranda's results based on practical experience. Thus, for example, because of the use of a specific amount of titanium, a specific amount of magnesium and a specific amount of chlorine and because of the use of inert organic solvents (non-polar solvents), it is possible to produce particles of homo and copolymer of olefins, for example ethylene, with controlled morphology having a higher bulk density and containing a very small quantity of fines and achieving a good co-monomer insertion into the final product as well as an improved catalyst activity with low catalytic decay. The commercial advantages of reaching only one of these goals, for example, a reduction in the quantity of fines, has significant commercial implications which might not be appreciated when viewing the invention from purely an academic viewpoint. As an example, although the Examiner argued at the interview that he could calculate the amounts of catalyst components using the ranges of Ti/Mg solution from step (a) of Luciani I and step (ii) from Luciani II, this cannot be done because the catalyst synthesis involves different kinds of unit

operations, such as for example, filtration, decantation, multiple washing and the like which would make a calculation substantially impossible.

In another example, the Examiner argues that the Applicant's Declarations are not persuasive because the few examples are all polymerized the same way, except for the amounts and ratios of Ti, Mg and Cl, and as such, disallows for any comparison to be made. The Appellants strongly disagree with the Examiner since the only way one determines the importance of the amounts of Ti, Mg and Cl is to make all of the other components identical so that the real influences of Ti, Mg and Cl in specific amounts can be determined.
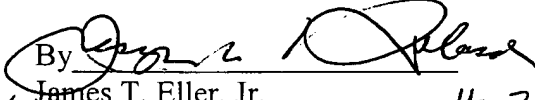
As pointed out in Table I above, and contrary to the Examiner's position in his Advisory Action, while there is some minimal overlap with respect to only some of the components Ti, Mg and Cl, when compared to the prior art, it is clear that there is a significant amount of "No" overlap. Since the Appellants believe that they have shown unexpected and advantageous results not achieved by the prior art, they have identified an invention contribution not recognized by the prior art.

VIII.   CLAIMS

A copy of the claims involved in the present appeal is attached hereto as Appendix A.

Dated: December 8, 2008   Respectfully submitted,

By _____
James T. Eller, Jr.
Registration No.: 39,538
BIRCH, STEWART, KOLASCH & BIRCH, LLP
8110 Gatehouse Road
Suite 100 East
P.O. Box 747
Falls Church, Virginia 22040-0747
(703) 205-8000
Attorney for Applicant

APPENDIX A

Claims Involved in the Appeal of Application Serial No. 10/518,443

Claim 1   (Cancelled)

2. (Previously Presented)   The process for producing a solid catalyst component according to claim 61, wherein the activated particulate silica used in step (a) is a microspheroidal, porous silica.

3. (Previously Presented) The process for producing a solid catalyst component according to claim 61, wherein the activated particulate silica used in step (a) has an average particle size ranging from 10 to 120 mm.

4. (Previously Presented) The process for producing a solid catalyst component according to claim 61, wherein the activated particulate silica used in step (a) has a surface area ranging from 250 to 500 m2/g.

5. (Previously Presented)   The process for producing a solid catalyst component according to claim 61, wherein the activated particulate silica used in step (a) has a pore volume ranging from 1.0 to 2.0 ml/g.

6. (Previously Presented) The process for producing a solid catalyst component according to claim 61, wherein the organometallic compounds of groups 1, 2, 12 or 13 of the periodic table used in step (a) are selected from the group consisting of trimethylaluminum, triethylaluminum (TEAL), methylaluminum dichloride, methylaluminum sesquichloride, isobutylaluminum dichloride, isobutylaluminum sesquichloride, ethylaluminum dichloride (EADC), diethylaluminum chloride (DEAC), ethylaluminum sesquichloride (EASC), tri-n-hexylaluminum (Tn-HAL), tri-n-octylaluminum (TnOAL), butyl ethylmagnesium (BEM), butyl octylmagnesium (BOMAG), methylmagnesium chloride and ethylmagnesium chloride.

7. (Previously Presented) The process for producing a solid catalyst component according to claim 48, wherein the magnesium compound used to prepare the solution in step (c) is selected from the group consisting of magnesium dichloride, magnesium diethylate, magnesium di-n-butylate, magnesium diisopropylate and magnesium diisobutylate.

Claim 8 (Cancelled)

9. (Previously Presented) The process for producing a solid catalyst component according to claim 48, wherein the titanium compound used to prepare the solution of the step (c) is selected from the group consisting of titanium tetra-n-propylate, titanium tetra-n-butylate, titanium tetra-i-propylate, titanium tetra-i-butylate or the corresponding titanium mono- or di-chloroalkoxides.

Claim 10 (Cancelled)

11. (Previously Presented) The process for producing a solid catalyst component according to claim 48, wherein the molar ratio Ti/Mg used to prepare the solution of the step (c) is between 0.3 and 4.

12. (Previously Presented) The process for producing a solid catalyst component according to claim 48, wherein the reducing agent used in the step (e) is a Na-alkyl, a Li-alkyl, a Zn-alkyl, a Mg-alkyl and corresponding aryl-derivatives, and compounds of the type RMgX wherein R represents linear or branched alkyl groups containing 1 to 10 carbons or alkyl-derivatives and X is a halogen atom.

13. (Previously Presented) The process for producing a solid catalyst component according to claim 48, wherein the reducing agent used in the step (e) is $(CH_3)_3SiO[(CH_3)HSiO]_nSi(CH_3)_3$, $(CH_3HSiO)_4$, $(CH_3HSiO)_3$, H_3Si-O-SiH_2-$OSiH_3$ or phenylhydropolysiloxanes in which the hydrogen atoms can be

partially replaced by methyl Groups and n is the degree of polymerization that ranges from 5 to 100.

Claim 14 (Cancelled)

15. (Previously Presented) The process for producing a solid catalyst component according to claim 48, wherein the halogenating agent used in the step (f) is selected from the group consisting of methylaluminum dichloride, methylaluminum sesquichloride, isobutylaluminum dichloride, isobutylaluminum sesquichloride, ethylaluminum dichloride (EADC), diethylaluminum chloride (DEAC), ethylaluminum sesquichloride (EASC), SiCl4, SnCl4, HCl, Cl2, HSiCl3, aluminum chloride, ethylboron dichloride, boron chloride, diethylboron chloride, HCCl3, PCl3, POCl3, acetyl chloride, thionyl chloride, methyl trichlorosilane, dimethyl dichlorosilane, TiCl4, VCl4, CCl4, t-butyl chloride, n-butyl chloride, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,2-dichloroethane and dichloromethane.

Claim 16 (Cancelled)

17. (Previously Presented) The process for producing a solid catalyst component according to claim 48, wherein the thermal treatment of step (g) is conducted from 0.5 hour to 5 hours and at a temperature from 60°C to 120°C.

18. (Previously Presented)   The process for producing a solid catalyst component according to claim 48, wherein two different organometallic compounds are used in step (i) to wash the solid obtained in step (h).

19. (Previously Presented) The process for producing a solid catalyst component according to claim 48, wherein more than one of the organometallic compounds in step (i) are fed together, mixed in the same solution.

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20. (Previously Presented)   The process for producing a solid catalyst component according to claim 48, wherein more than one of the organometallic compounds in step (i) are fed together, in individual solutions.

21. (Previously Presented) The process for producing a solid catalyst component according to claim 48, wherein more than one of the organometallic compounds in step (i) are fed one after the other, in individual solutions.

22. (Previously Presented) The process for producing a solid catalyst component according to claim 48, wherein the organometallic compound used in step (i) is selected from the group consisting of methylaluminum dichloride, methylaluminum sesquichloride, isobutylaluminum dichloride, isobutylaluminum sesquichloride, ethylaluminum dichloride (EADC), diethylaluminum chloride (DEAC), ethylaluminum sesquichloride (EASC), tri-n-hexylaluminum (Tn-HAL) and tri-n-octylaluminum (TnOAL).

23. (Previously Presented)   The process for producing a solid catalyst component according to claim 48, wherein the inert organic solvent of step (a) is selected from the group consisting of hexane, heptane, octane or isoparaffin.

Claim 24 (Cancelled)

25. (Previously Presented)   The solid catalyst component according to claim 50, wherein the solid catalyst component morphology is spheroidal.

26. (Previously Presented) The solid catalyst component according to claim 50, wherein the solid catalyst component has an average particle size ranging from 10 to 120 mm.

27. (Previously Presented)   The solid catalyst component according to claim 50, wherein the solid catalyst component has a surface area ranging from 80 to 300 m2/g.

28. (Previously Presented)   The solid catalyst component according to claim 50, wherein the solid catalyst component has a pore volume ranging from 0.1 to 1.0 ml/g.

Claims 29-30 (Cancelled)

31. (Previously Presented) The solid catalyst component according to claim 50, wherein the organometallic compound of the groups 1, 2, 12 or 13 of the periodic table is present in an amount ranging from 0.003 to 0.03 g of metal per g of solid catalyst component.

32. (Previously Presented) The solid catalyst component according to claim 50, wherein the organometallic compound of the groups 1, 2, 12 or 13 of the periodic table is selected from a group consisting of an organo-aluminum, an organo-magnesium, an organo-lithium and an organo-zinc compound.

33. (Previously Presented)   The solid catalyst component according to claim 50, wherein the alkoxy groups are present in an amount ranging from 0.03 to 0.08 g of alkoxy groups per g of solid catalyst component.

34. (Previously Presented)   The solid catalyst component according to claim 50, wherein the alkoxy groups are selected from the group consisting of n-propoxy, i-propoxy, n-butoxy or i-butoxy.

Claim 35-36 (Cancelled)

37. (Previously Presented)   The process for the copolymerization of ethylene according to claim 51, wherein said process is carried out in a gas phase.

38. (Previously Presented)   The process for the copolymerization of ethylene according to claim 51, wherein the catalyst used in the polymerization process is an alkyl aluminum.

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39. (Previously Presented)   The process for the copolymerization of ethylene according to claim 51, wherein the catalyst used in the polymerization process is trimethyl aluminum or triethyl aluminum.

40. (Previously Presented)   The process for the copolymerization of ethylene according to claim 51, wherein the mass ratio co-catalyst:catalyst in the polymerization process is between 0.5:1 and 6:1.

41. (Previously Presented) The process for the copolymerization of ethylene according to claim 51, wherein the catalyst is fed into a polymerization reactor as a dry bulk powder, as a paste, as an oil suspension or as a solvent suspension.

42. (Previously Presented)   The process for the copolymerization of ethylene according to claim 41, wherein the catalyst is fed directly into a polymerization reactor.

43. (Previously Presented) The process for the copolymerization of ethylene according to claim 41, wherein the catalyst is prepolymerized before being fed into a polymerization reactor.

44. (Previously Presented)   The process for the copolymerization of ethylene according to claim 41, wherein the catalyst is prepolymerized with ethylene or propylene before being fed into a polymerization reactor.

45. (Previously Presented) A linear low density polyethylene produced according to claim 51.

46. (Previously Presented)   A linear medium density polyethylene produced according to the process of claim 51.

47. (Previously Presented)   A high density polyethylene homopolymer produced from the catalyst composition of claim 65.

48. (Previously Presented) A process for producing a solid catalyst component which is substantially free of polar solvents and which is used in the copolymerization of ethylene with one or more alpha-olefins, which consists essentially of:

(a) impregnating an activated particulate silica with a solution of an organometallic compound of the group 1, 2, 12 or 13 of the Periodic Table in an inert organic solvent;

(b) removing the impregnating liquid from step (a);

(c) preparing a solution by reacting at least one magnesium compound selected from the group consisting of magnesium chloride and magnesium alkoxides with at least one titanium compound selected from the group consisting of titanium alkoxides and titanium chlorine alkoxides;

(d) impregnating the silica obtained in (b) using the solution prepared in (c), said silica containing magnesium in an amount of 0.3 to 3.0 % by weight and titanium in an amount of 0.5 to 2.0 % by weight, based on the weight of the catalyst;

(e) optionally reacting the impregnated solid obtained in (d) with a reducing agent in an amount of from 0 to 2 moles per mole of titanium; and

(f) reacting the impregnated solid produced in (d) or (e) with a chlorine containing agent to produce a chlorine content in an amount of 5 to 12 % by weight, based on the weight of the catalyst;

(g) thermally treating the impregnated solid produced in (f);

(h) washing the thermally treated solid produced in (g) with an inert organic solid; and

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(i) optionally washing the solid produced in (h) with a solution of one or more organometallic compounds of groups 1, 2, 12 or 13 of the Periodic Table.

49. (Previously Presented) The process of claim 48 wherein the activated particulate silica is produced by heating silica in an inert atmosphere at a temperature of 100 to 750°C and for a period such that the amount of OH remaining on the silica surface after this treatment ranges from 0.1 to 2 mmoles OH per g of silica.

50. (Previously Presented) A solid catalyst component used in the copolymerization of ethylene, produced by the process of claim 61.

51. (Previously Presented) A process for the copolymerization of ethylene which comprises conducting the copolymerization in the presence of the activated particulate silica catalyst produced by the process of claim 61.

Claim 52 (Cancelled)

53. (Previously Presented) The catalyst composition of claim 58, wherein magnesium is obtained from magnesium chloride or magnesium alkoxides.

54. (Previously Presented) The catalyst composition of claim 58, wherein the titanium is obtained from titanium alkoxides or titanium chlorine alkoxides.

55. (Previously Presented) The catalyst composition of claim 58, wherein the chlorine is obtained from a chlorine-containing agent.

56. (Previously Presented) The catalyst composition of claim 58, wherein the magnesium is present in an amount of 0.3 to 1.5 % by weight.

57. (Previously Presented) The catalyst composition of claim 58, wherein the chlorine is present in an amount of 5 to 10.8 % by weight.

58. (Previously Presented) A catalyst composition substantially free of polar solvents and used for the copolymerization of ethylene with one or more alpha-olefins, which consists essentially of

an activated particulate silica carrier, impregnated with an organo metallic compound and catalytic active components including magnesium, titanium and chlorine, wherein, based on the weight of the catalyst, titanium is present in an amount of 0.5 to 2 % by weight, magnesium is present in an amount of 0.3 to 3.0 % by weight and chlorine is present in an amount of 5 to 12% by weight, wherein a product of said copolymerization exhibits an enhanced bulk density, a small amount of fines and a substantially homogeneous distribution of the alpha-olefins within the polymer chain.

59. (Previously Presented) The catalyst composition of claim 58, wherein the resulting copolymer is a LLDPE copolymer.

60. (Previously Presented) A process for the copolymerization of ethylene which comprises conducting the copolymerization in the presence of the activated particulate silica catalyst of claim 58.

61. (Previously Presented) A process for producing a solid catalyst component which is substantially free of polar solvents and which is used in the copolymerization of ethylene and with one or more alpha-olefins, which consists essentially of

(a) impregnating an activated particulate silica with a solution of an organometallic compound of the group 1, 2, 12 or 13 of the Periodic Table in an inert organic solvent; and

(b) further impregnating the silica with at least one magnesium component selected from the group consisting of magnesium chloride and magnesium alkoxide, at least one titanium component selected from the group

JTE/JAK/njp

consisting of titanium alkoxides and titanium chlorine alkoxides and a chlorine-containing agent to obtain silica with a magnesium content of 0.3 to 3.0% by weight, a titanium content of 0.5 to 2.0 % by weight and a chlorine content of an amount of 5 to 12 % by weight, based on the weight of the catalyst, wherein a product of said copolymerization exhibits an enhanced bulk density, a small amount of fines, and a substantially homogeneous distribution of the alpha-olefin within the polymer chain.

62. (Previously Presented) The catalyst composition of claim 58, wherein the product of said copolymerization has a fraction soluble in xylene of equal to or less than 10%, a polymer density of 0.917 to 0.919 g/cm^3, and a melt index of 0.65 to 0.91 g/10 min.

63. (Previously Presented) The catalyst composition of claim 58, wherein the bulk density is equal to or greater than 0.36 g/cm^3.

64. (Previously Presented) The catalyst composition of claim 58, wherein the product of said copolymerization has a melt flow rate (MFR) of less than 27.

65. (Previously Presented) A catalyst composition substantially free of polar solvents and used for the homopolymerization of ethylene which consists essentially of an activated particulate silica carrier, impregnated with an organo metallic compound and catalytic active components including magnesium, titanium and chlorine, wherein, based on the weight of the catalyst, titanium is present in an amount of 0.5 to 2 % by weight, magnesium is present in an amount of 0.3 to 3.0 % by weight and chlorine is present in an amount of 5 to 12% by weight, wherein a product of said homopolymerization exhibits a narrow molecular weight distribution, an enhanced bulk density and a small amount of fines.

66. (Previously Presented) The catalyst composition of claim 65, wherein the Mg is present in an amount of 0.3 to 1.5% by weight

67. (Previously Presented) The catalyst composition of claim 65, wherein the bulk density is equal to or greater than 0.36 g/^{3}cm .

68. (Previously Presented) The catalyst composition of claim 65, wherein the product of said homopolymerization has a melt flow rate (MFR) of less than 27.

JTE/JAK/njp

69. (Previously Presented) The catalyst composition of claim 65, wherein the resulting homopolymer is HDPE.

70. (Previously Presented) The process of claim 61, wherein the product of said copolymerization has a fraction soluble in xylene of equal to or less than 10%, a polymer density of 0.917 to 0.919 g/cm^3, and a melt index of 0.65 to 0.91g/10 min.

71. (Previously Presented) A linear low density polyethylene copolymer produced from the catalyst composition of claim 58.

72. (Previously Presented) A linear low density polyethylene film produced from the catalyst composition of claim 58.

73. (Previously Presented) The linear, low density polyethylene film of claim 72, having a haze value of 11.3 to 11.6%, a gloss of 79.3 to 80.7% and a blocking strength of 15 to 30 g/100 cm^2.

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APPENDIX B

No copy of evidence pursuant to §§ 1.130, 1.131, or 1.132 and/or evidence entered by or relied upon by the Examiner that is relevant to this appeal is attached hereto. However, the Declaration Under 37 CFR 1.132 filed on January 8, 2008 is relied upon and referenced in the Appeal Brief.

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APPENDIX C

No related proceedings are referenced in II. above, hence copies of decisions in related proceedings are not provided.